7-3-2008

Corn Following Corn in 2008

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Corn Following Corn in 2008

By Mahdi Al-Kaisi, Roger Elmore, Antonio Mallarino, Palle Pedersen, Alison Robertson, John Sawyer, and Jon Tollefson

Corn following corn is in rough shape in areas across Iowa. Many wonder what is happening. The crop's condition in general is not normal for this time of year. For example, last Sunday the USDA rated this year's Iowa corn crop as 54 percent in 'Good' to 'Excellent' condition and 15 percent is 'Poor' or 'Very Poor.' Last year 72 percent was rated 'Good' to 'Excellent' and 5 percent was in 'Poor' or 'Very Poor' condition during the same week. Average plant height as of Sunday was 24 inches compared to 40 inches at end of the same week last year. Growing Degree Days continue to lag behind normal all over the state.

FIGURE 1. Plant height differences between corn following soybeans (left) and corn following corn (right) in the Long-term Nitrogen Study conducted by John Sawyer and Dan Barker. Nitrogen application rate on both plots was 240 lbs/acre, spring applied. Thus, N is not limiting plant growth. Iowa State University. Photos taken on 30 June 2008 by Roger Elmore.

Certainly, plant heights and crop conditions in late June are not necessarily correlated with yield. There is a lot of the growing season to go yet. In baseball language, although the crop is only perhaps in the 3rd inning, it really hasn't had a lot of chance to bat. Warmer weather in the last week has helped immensely.

So why is the corn following corn in this condition?

Yields – what can we expect?

First remember why we rotate corn and soybean: crop rotation usually results in maximum yield of both crops. In the very best of years corn following corn will yield as well as corn following soybean. In the worst

of years lower yields occur when corn follows corn. These are years with climatic stresses – most notably dry years and those with wet springs.

Over the last eight years, Iowa corn yields following corn have ranged from almost the same to 27 percent less than yield of corn following soybeans. The eight-year average is 14 percent less (Table 1). Crop rotation is an important tool for us to maximize yield and profitability. Planting corn after corn usually results in reduced yield which results from a less than ideal growing environment.

46 Site-Years in Iowa, at Maximum N Response				
Year	SC	CC	Difference	
	- - - - - - bu/acre - - - - - -			%
2000	160	158	2	1.3
2001	146	115	31	21.4
2002	155	120	35	22.7
2003	162	119	44	26.9
2004	203	203	-1	-0.3
2005	190	161	29	15.3
2006	197	181	15	7.8
2007	199	172	27	13.6
Average	178	154	24	14.2
J.E. Sawyer and D.W. Barker, Iowa State University				

Table 1. Corn yields following soybean (SC) and following corn (CC) across multiple Iowa locations. To insure N was not limiting, the yields for each rotation are at the maximum yield response to applied N. Iowa State University, 2000-2007.

Agronomics

Reasons for lower yields (Table 1) when corn is planted after corn are multifaceted. Many publications are available on the subject (for one example, see ICM news, Feb. 12, 2007, in the archives). Some of these reasons include: allelopathy, autotoxicity, increased residue, residue breakdown products, organic acids, nitrogen, N, issues, lower soil temperatures especially with no-till in poorly drained soils, reduced plant stand, and slower early vegetative growth. Slower growth could result in tasseling and silking occurring during drier periods, as well as delayed maturity with an increased risk of fall frost damage.

Regarding nitrogen (N) issues, N immobilization, low soil inorganic N, and inadequate N to meet early corn N needs (either applied before or at planting), can all result in poorer performance of corn following corn. More information on N fertilization for corn following corn and an N-rate calculator are available.

The beneficial effects of starter N and Phosphorus are more likely for corn following corn than for corn following soybean. This is especially true in areas with large residue accumulation, resulting from reduced tillage systems, and with excessively wet and cool soils.

Continuous corn can impact soil biological diversity by limiting microbial biomass. The microbial biomass is essential for nutrient cycling. Production of corn following corn often encourages the use of intensive tillage due to the increased residue production. More intensive tillage affects microbial diversity and the soil's physical, chemical, and biological condition.

Seedling Diseases

An increase in the prevalence of seedling disease may be another reason why corn following corn looks so bad this year. The risk of

disease in corn following corn fields is always greater than in fields that have been rotated to nonhost crops because of increased amounts of inoculum. Many corn pathogens survive in infested corn residue. Continuous-corn fields, in particular those with crop residues left on the surface, are more prone to seedling diseases due to higher inoculum pressure and cooler, wetter soils. This year the very wet and cool start to the growing season has further favored the development of seedling diseases.

Infection by seedling pathogens results in seed rot, root rot, and mesocotyl rot. Affected seedlings are stunted, off-color, and/or lack vigor. Why? Because the developing seedling relies on the seminal roots and mesocotyl for water and nutrient uptake up until around growth stage V6, then the crown roots become active. Thus, it is possible that the poor looking corn we are seeing in continuous corn fields is in part a result of increased seedling disease.

Insects

Insects are another possibility as we ponder the reason why corn following corn looks worse than when it is grown following soybeans. Corn rootworms have adapted to crop rotation, but they still are more serious pests when corn is grown continuously. The above-ground effects of their root feeding, and their impacts on yield, will be more severe when continuous corn is under stress. Early growing conditions many of us have experienced, saturated soils and cool temperatures, will magnify their impact. Heavy amounts of rain filled the soil with water resulting in shallower root systems. Cool temperatures cause slower root growth and regrowth after insect feeding injury. Remember also that the corn rootworm eggs will be distributed in clumps in the fields.

Finally, none of the control options, insecticides or genetically-modified rootworm corn, will control all of the larvae. Consequently as you search for a reason for patches of uneven, short, yellow corn make sure you look at the root systems for corn rootworm larval feeding. Larvae root pruning could cause the symptoms you are seeing.

Risk Management

Remember the corn and soybean rotation as a system and not as two separate crops. Consider risk, especially when we have such small profit margins with our crops. By alternating corn and soybean, we minimize risk compared to a two-year corn and one-year soybean rotation or similar combinations. Many producers think corn will never fail because of the high yields we have experienced within the last five years. Nonetheless, anything is possible when dealing with our current volatile weather systems. Alternating corn and soybean is likely still the most profitable rotation sequence to maximize profit for most farmers in Iowa. Information to help make the most profitable decisions regarding crop rotation can be found on the Ag Decision Maker website.

Summary

The poor performance of corn under continuous corn system is very complex and multifaceted. Yield reductions are often associated with continuous corn due to the host of factors that are listed above as compared to corn following soybean or any extended crop rotation.

Additional links:
Yield penalty when corn follows corn

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